Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (currently amended) A method, using a computer system, for designing a microfluidic circuit schematic comprising a plurality of microfluidic component symbols associated with a plurality of microfluidic components, said method comprising:

placing a first component symbol of said plurality of microfluidic component symbols on a schematic, wherein said first component symbol has associated [[functional information]] property;

placing a second component symbol of said plurality of microfluidic component symbols on said schematic; and

connecting said first component symbol to said second component symbol;

wherein said associated property has at least one of physical scaling, physical property, layer assignment, and functional definition; and said physical property includes a physical dimension having depth information.

2. (original) The method of claim 1 wherein said plurality of microfluidic component symbols are multilayered symbols.

3. (original) The method of claim 1 wherein said plurality of microfluidic components comprise structures having an elastomeric material.

4. (original) The method of claim 1 wherein said first component symbol comprises a first indication for a control channel and a second indication for a fluid channel.

5. (original) The method of claim 4 wherein said first indication is placed on a first layer and said second indication is placed on a second layer.

6. (original) The method of claim 1 wherein said first component symbol functions as a NAND gate.

7. (original) The method of claim 1 wherein said first component symbol functions as a S-R latch.

8. (original) The method of claim 1 wherein said plurality of microfluidic component symbols are selected from the group consisting of channel symbols, pump symbols, valve symbols, chamber symbols, multiplexer symbols, bridge symbols, macro symbols, user defined symbols, and layer interconnect symbols.

9. (original) The method of claim 1 wherein said first component symbol comprises a first control channel symbol and a first fluid channel symbol, said second component symbol comprises a second control channel symbol and a second fluid channel symbol, and said connecting comprises connecting said first fluid channel symbol to said second fluid channel symbol.

10. (original) The method of claim 1 wherein said first component symbol comprises a first control channel symbol and a first fluid channel symbol, said second component symbol comprises a second control channel symbol and a second fluid channel symbol, and said connecting comprises connecting said first control channel symbol to said second control channel symbol.

11. (original) The method of claim 1 wherein said connecting includes a design rule check.

12. (original) The method of claim 1 wherein selected component symbols of said microfluidic circuit schematic include functional information and are functionally simulated by applying control signals to said selected component symbols to show functional connectivity.

13. (original) The method of claim 12 wherein functionally simulating selected component symbols comprises defining functional information of said selected component symbols as including Boolean expressions with operands based on control ports of the selected component symbols which control connections to input ports and output ports of the selected component symbols.

14. (original) The method of claim 12 wherein functionally simulating selected component symbols comprises simulating actuation of said selected component symbols using control signals generated by a Boolean based language with timing constraints.

15. (currently amended) A method for capturing a design of a microfluidic system using a computer aided design tool, said method comprising:

selecting a schematic having a plurality of layers;

placing a first symbol representing a first component of a plurality of microfluidic components on [[a]] said schematic, said first component comprising a first fluid channel symbol and a first control channel symbol, said first symbol having related functional information, said first fluid channel symbol and said first control channel being on different layers of said plurality of layers;

placing on said schematic a second symbol representing a second component of said plurality of microfluidic components, said second component comprising a second fluid channel and a second control channel; and

connecting said first symbol to said second symbol.

16. (original) The method of claim 15 wherein said first symbol is an IDEF0 symbol.

17. (original) The method of claim 16 wherein said second symbol is another IDEF0 symbol and said connecting includes connecting an output of said IDEF0 symbol to an input of said another IDEF0 symbol.

18. (original) The method of claim 15 wherein said second symbol is a multilayered symbol having a first channel on a first layer and a second channel on a second layer.

19. (original) The method of claim 15 wherein said first symbol includes a first indication for said first fluid channel and a second indication for said first control channel.

20. (original) The method of claim 15 wherein said plurality of microfluidic components are selected from the group consisting of channels, pumps, valves, chambers, pressure oscillators, and layer interconnects.

21. (original) The method of claim 15 wherein symbols are connected according to predetermined design rules.

22. (original) The method of claim 15 wherein said first symbol is placed interactively on said schematic.

23. (original) The method of claim 15 wherein said first symbol is placed automatically on said schematic.

24. (currently amended) A design capture system for capturing a microfluidic circuit comprising a plurality of microfluidic components, said design capture system comprising:

a microfluidic component library comprising functional information and symbols associated with said plurality of microfluidic components, wherein each of said symbols has associated property; and

a schematic entry module used for placing and connecting said symbols;

wherein said associated property has at least one of physical scaling, physical property, layer assignment, and functional definition; and said physical property includes a physical dimension having depth information.

25. (original) The design capture system of claim 24 wherein said symbols are multilayered symbols.

26. (original) The design capture system of claim 24 wherein said symbols have depth information.

27. (original) The design capture system of claim 24 wherein one of said symbols includes a first indication for a fluid channel and a second indication for a control channel.

28. (original) The design capture system of claim 24 wherein said plurality of microfluidic components comprise structures having an elastomeric material.

29. (original) The design capture system of claim 24 wherein said placing of said symbols includes dragging and dropping a symbol from an active library area to an active drawing area.

30. (original) The design capture system of claim 24 wherein said schematic entry module includes a window on a display, said window comprising a component library area and an active drawing area.

31. (original) The design capture system of claim 30 wherein said window further includes a layer area, said layer area indicating a layer of a plurality of drawing layers in said active drawing area that has items on said layer displayed.

32. (currently amended) A computer program product stored in a computer readable medium for capturing a design of a microfluidic system using a computer aided design tool, said computer program product comprising:

code for selecting a schematic having a plurality of layers;

code for placing a first symbol representing a first component of a plurality of microfluidic components on a schematic, said first component comprising a first fluid channel and a first control channel;

code for placing a first symbol representing a first component of a plurality of microfluidic components on [[a]] said schematic, said first component comprising a first fluid channel symbol and a first control channel symbol, said first fluid channel symbol and said first control channel being on different layers of said plurality of layers;

code for placing a second symbol representing a second component of said plurality of microfluidic components, on said schematic, said second component comprising a second fluid channel and a second control channel; and

code for connecting said first symbol to said second symbol.

33. (currently amended) A method for synthesizing a network model of a microfluidic circuit comprising a plurality of microfluidic components, said method comprising:

storing in a computer readable medium a synthesis program;

selecting from a database, component models associated with said plurality of microfluidic components, said component models having layer information and channel depth information; and

generating said network model by using said component models and said synthesis program, wherein said component models are connected together using said layer information and channel depth information.

34. (original) The method of claim 33 wherein said plurality of microfluidic components comprise structures having an elastomeric material.

35. (original) The method of claim 33 wherein one of said component models includes a symbol related to a component of said plurality of microfluidic components.

36. (original) The method of claim 33 wherein said network model is displayed as a schematic, comprising symbols of said plurality of microfluidic components connected together.

37. (original) The method of claim 33 wherein said database includes a macro library and a basic library of microfluidic components.

38. (original) The method of claim 33 wherein said synthesis program comprises code selected from the group consisting of VHDL, Verilog, VHDL-AMS, Verilog-A, VHDL-A, Verilog-AMS, C, and C++.

39. (currently amended) A synthesis system for creating a schematic of a microfluidic circuit comprising a plurality of microfluidic components, said synthesis system comprising:

a memory for storing synthesis code related to said schematic;

a design library comprising a plurality of indications associated with said plurality of microfluidic components, said plurality of indications having layer information and channel depth information, wherein selected indications of said plurality of indications are selected using said synthesis code; and

a synthesis module for creating said schematic by connecting said selected indications using layer information and channel depth information associated with said selected indications.

40. (original) The synthesis system of claim 39 further comprising a display module for showing said schematic.

41. (original) The synthesis system of claim 39 wherein said synthesis module is configured to optimize said schematic.

42. (original) The synthesis system of claim 39 wherein said synthesis code comprises code selected from a group consisting of VHDL, Verilog, VHDL-AMS, Verilog-A, VHDL-A, Verilog-AMS, C or C++.

43. (currently amended) A computer program product stored in a computer readable medium for synthesizing a network model of a microfluidic circuit comprising a plurality of microfluidic components, said computer program product comprising:

a synthesis program;

code for selecting from a database, software component models associated with said plurality of microfluidic components, said software component models having layer information and channel depth information; and

code for generating said network model by using said software component models, including said layer information and channel depth information and said synthesis program, wherein said software component models are connected together.

44. (currently amended) A method for functionally analyzing a schematic, having a control layer and a fluid layer, of a microfluidic circuit comprising a plurality of microfluidic components, said method comprising:

selecting a functional model for a component of said plurality of microfluidic components;

determining a logic control test sequence for said control layer of said schematic; and

functionally simulating said schematic by using said functional model in said schematic and said logic control test sequence to show functional connectivity of the microfluidic circuit.

45. (original) The method of claim 44 wherein said plurality of microfluidic components comprise structures having an elastomeric material.

46. (original) The method of claim 44 wherein said functional model includes code selected from the group consisting of VHDL, Verilog, VHDL-AMS, Verilog-A, VHDL-A, Verilog-AMS, C, and C++.

47. (original) The method of claim 44 wherein said logic control test sequence includes code from a digital simulation language.

48. (original) The method of claim 44 wherein said logic control test sequence includes code selected from the group consisting of VHDL, Verilog, VHDL-AMS, Verilog-A, VHDL-A, Verilog-AMS, C, and C++.

49. (original) The method of claim 44 wherein said logic control test sequence includes code from a Diagnostic Chip Control language (DCCL).

50. (currently amended) A system for functionally analyzing a schematic, having at least one control layer and at least one fluid layer, of a microfluidic circuit comprising a plurality of microfluidic components, said system comprising:

a functional model for a component of said plurality of microfluidic components;

a logic control test sequence for at least one control layer of said schematic; and

a functional simulator for functionally simulating said schematic by using said functional model in said schematic and said logic control test sequence to show functional connectivity of the microfluidic circuit.

51. (original) The method of claim 50 wherein said functional model includes code selected from the group consisting of VHDL, Verilog, VHDL-AMS, Verilog-A, VHDL-A, Verilog-AMS, C, and C++.

52. (original) The method of claim 50 wherein said plurality of microfluidic components comprise structures having an elastomeric material.

53. (currently amended) A computer program product stored in a computer readable medium for functionally analyzing a schematic, having at least one control layer, of a microfluidic circuit comprising a plurality of microfluidic components, said computer program product comprising:

code for selecting a functional model for a component of said plurality of microfluidic components;

code for determining a logic control test sequence for at least one control layer of said schematic; and

code for functionally simulating said schematic by using said functional model in said schematic and said logic control test sequence to show functional connectivity of the microfluidic circuit.

54. (currently amended) A computer program product stored in a computer readable medium for designing a microfluidic circuit schematic comprising a plurality of microfluidic component symbols associated with a plurality of microfluidic components, said computer program product comprising:

code for placing a first component symbol of said plurality of microfluidic component symbols on a schematic, wherein said first component symbol has associated [[functional information]] property;

code for placing a second component symbol of said plurality of microfluidic component symbols on said schematic; and

code for connecting said first component symbol to said second component symbol;

wherein said associated property has at least one of physical scaling, physical property, layer assignment, and functional definition; and said physical property includes a physical dimension having depth information.

55. (original) The method of claim 54 wherein said first component symbol comprises a first indication for a control channel and a second indication for a fluid channel.

56. (currently amended) A microfluidic circuit design system comprising:

a synthesis module for synthesizing software of a design into a component level description of said design, said design comprising a plurality of microfluidic components, and said component level description comprising multilayered symbols associated with said plurality of microfluidic components;

a design capture module, including a schematic entry tool, for placing and connecting said multilayered symbols on a schematic according to said design; and

a functional analysis module for functionally simulating selected multilayered symbols of said schematic to show functional connectivity thereof.

57. (original) The system of claim 56 wherein the modules comprise instructions stored in a computer-readable medium.